REMARKS

The Examiner is thanked for carefully reviewing the present application. The present amendment is in response to the Office Action mailed on May 2, 2003 rejecting claims 1-6, 9-14 and 17. The applicants have thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the references cited therein. The above amendment and following remarks are believed to be fully responsive to the Office Action and render all claims at issue patentably distinguishable over the cited references.

Reconsideration and allowance of the present application based on the following remarks is respectfully requested.

Claims 4 and 5 are canceled, claims 1, 9 and 17 are amended, and thus claims 1-3, 6, 9-14 and 17 are pending. No new matter is introduced.

Claim Rejection under 35 U.S.C. §112

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants have canceled claim 4, and respectfully request that the section 112 rejection be withdrawn.

Claim Rejections under 35 U.S.C. §103

(1) Claims 1-4, 6 and 17

Claims 1-4, 6 and 17 are rejected under 35 U.S.C.103(a) as being unpatentable over Walsh et al. (US 6,228,741) (hereinafter referred to as "Walsh et al.") in combination with Andrews et al. (US 2001/0036709) (hereinafter referred to as "Andrews et al."), Sakai et al. (US 6,268,263) (hereinafter referred to as "Sakai et al.") and Lee (US 5,981,355) (hereinafter

referred to as "Lee"). These rejections are respectfully traversed. The applicants have canceled claims 4 and 5, and incorporated claim 5 into independent claim 1. As will be fully explained below, it is respectfully submitted that Walsh et al. in combination with Andrews et al., Sakai et al. and Lee do not render the claimed invention obvious, and the applicants respectfully request that the section 103(a) rejection be withdrawn.

With regard to amended claim 1 and amended claim 17, the applicants claim a method of forming a shallow trench isolation structure. In the method, an oxide layer is formed to cover a substrate, wherein the substrate has a first silicon nitride layer formed thereon, and a shallow trench is located in the substrate and the first silicon nitride layer, and a wet etching step is performed to etch the oxide layer until the first silicon nitride layer above the edge of the shallow trench is about exposed. Next, a second silicon nitride layer is formed to cover the oxide layer and the first silicon nitride layer, and a defined photoresist is formed to cover the second silicon nitride layer and expose a portion of the second silicon nitride layer. Then, a dry etching step is performed to etch the exposed portion of the second silicon nitride layer and the oxide layer beneath the exposed portion of the second silicon nitride layer until the first silicon nitride layer is exposed. Subsequently, the photoresist is removed. Then, the second silicon nitride layer and the first silicon nitride layer are removed, wherein the oxide layer between the second silicon nitride layer and the first silicon nitride layer is completely removed while the second silicon nitride layer and the first silicon nitride layer are removed. In the claimed invention, the first silicon nitride layer, the second silicon nitride layer, and the oxide layer between the first silicon nitride layer and the second silicon nitride layer are removed in **two** etching steps.

However, in col. 3, lines 11-27 and Fig. 6-8, Walsh et al. disclose that the cap nitride 50 is removed by using H_3PO_4, and then the oxide 40 between the cap nitride 50 and mask nitride 20 is completely removed by using dilute HF after the photoresist 60 is removed. The oxide 40, the cap nitride 50 and the mask nitride 20 are removed in **three** etching steps. Apparently, the processes of removing the cap nitride 50, mask nitride 20, and the oxide 40 between the cap nitride 50 and mask nitride 20 are different from and more complicated than those in amended claims 1 and 17.

Besides, in Andrews et al., referring to [0022], lines 13-17, the oxide layer 50 outside the trench 50b is removed by performing **a wet** etching step. Therefore, the combination of Walsh et al. and Andrews et al. does not disclose or teach the claimed **dry** etching step to remove a portion of the second silicon nitride layer and the oxide layer beneath the exposed of the second silicon nitride layer, and the oxide layer between the first silicon nitride layer and the second silicon nitride layer is removed while the first silicon nitride layer and the second silicon nitride layer are removed.

In Sakai et al., referring to col. 11, lines 60-65 and FIG. 7-FIG. 8, the silicon oxide films 11B, 11DC, 11DE and 11FE that remain in the active regions 30 are polished and removed by the CMP method, and the silicon nitride film 3 is removed after the silicon oxide films 11B, 11DC, 11DE and 11FE are removed. Therefore, in the Sakai et al., no second silicon nitride film is formed to cover the silicon oxide 11 and a dry etching step is performed to removed the exposed portion of the silicon oxide 11 only, and the silicon oxide films 11B, 11DC, 11DE and 11FE are removed before the silicon nitride film 3. Apparently, the technique features of Sakai et al. are different from those of the claimed invention, and Sakai et al. do not disclose or teach the features of the

claimed invention.

The combination of Walsh et al., Andrews et al. and Sakai et al. does not disclose ***(i)*** the exposed second silicon nitride layer and the oxide layer beneath the exposed second silicon nitride layer are removed by using a dry etching method, and ***(ii)*** the oxide layer between the first silicon nitride layer and the second silicon nitride layer are removed while the first silicon nitride layer and the second silicon nitride layer are removed.

In Lee, referring to FIG. 2d-FIG. 2f, the CVD oxide layer 15 is etched by using an etch back process to expose the insulating pattern 12a and 12b, and the remaining CVD oxide layer 15b is automatically lifted off and removed while the insulating pattern 12a and 12b are removed. In order to make sure the insulating pattern 12a and 12b are exposed and removed subsequently, the end point of the etch back process of the CVD oxide layer 15 is not easy to control, thereby making it difficult to control the thickness of the CVD oxide layer 15a in the trenches 13a. The claimed invention has improved on Lee. Lee does not disclose or teach using a **dry** etching method to remove the exposed portion of the second silicon nitride layer and the oxide layer beneath the exposed portion of the second silicon nitride layer.

In addition, Wolf teaches etching silicon nitride layers by a dry etching process, but Wolf does not teach using a dry etching process to etch silicon nitride layers and oxide layers.

According to the foregoing discussions, neither the combination of Walsh et al., Andrews et al., Sakai et al. and Lee discloses the claimed feature of using a dry etching process to etch the exposed second silicon nitride layer

and the oxide layer beneath the exposed second silicon nitride layer, nor Wolf teaches using a dry etching process to etch a silicon nitride layer and an oxide layer. Therefore, a person of ordinary skill in the art would not have been motivated to combine the teachings disclosed by Walsh et al., Andrews et al., Sakai et al. and Lee with the teachings disclosed by Wolf. Even if Walsh et al., Andrews et al., Sakai et al., Lee and Wolf are combinable, all features of the claimed invention would not be taught by the references' combination.

Just as described above, since all features in amended claims 1 and 17 are not disclosed by Walsh et al., Andrews et al., Sakai et al., Lee and Wolf, and the Examiner's combination of Walsh et al., Andrews et al., Sakai et al., Lee and Wolf, if proper, would not render amended claims 1 and 17 in the present application obvious, claims 1 and 17 are allowable.

Since claims 1 and 17 are allowable, dependent claims 2-3 and 6 each of which depends from independent claim 1 are likewise believed to be allowable. Accordingly, the applicants respectfully request that the section 103(a) rejections be withdrawn.

(2) Claim 5

Claim 5 is rejected under 35 U.S.C.103(a) as being unpatentable over Walsh et al. (US 6,228,741) in combination with Andrews et al. (US 2001/0036709), Sakai et al. (US 6,268,263) and Lee (US 5,981,355) as applied to claims 1-4, 6 and 17 above, and further in view of Wolf. Applicants have canceled claim 5, and respectfully request that the section 103(a) rejection be withdrawn.

(3) Claims 9-14

Claims 9-14 are rejected under 35 U.S.C.103(a) as being unpatentable over Sakai et al. (US 6,268,263) in combination with Lee (US 5,981,355). These rejections are respectfully traversed. As will be fully explained below, it is respectfully submitted that Sakai et al. in combination with Lee do not render the claimed invention obvious, and the applicants respectfully request that the section 103(a) rejection be withdrawn.

With regard to amended claim 9, the applicants claim a method of forming a shallow trench isolation structure, comprising: forming an oxide layer to cover a substrate, wherein the substrate has a silicon nitride layer formed thereon, and a shallow trench is located in the substrate and the silicon nitride layer; performing a wet etching step to etch the oxide layer until the silicon nitride layer above the edge of the shallow trench is about exposed; forming a photoresist to cover the oxide layer; defining the photoresist to expose a portion of the oxide layer, and etching the portion of the oxide layer until the silicon nitride layer is exposed; and removing the photoresist and the silicon nitride layer completely, and the oxide layer is removed while the silicon nitride layer is removed. Since the silicon nitride layer is **exposed**, the entire silicon nitride layer can be removed, and the oxide layer remaining on the silicon nitride layer can be lifted off.

However, in FIG. 7 of Sakai et al., the silicon nitride film 3B is **not exposed**, so the silicon nitride film 3 cannot be removed completely, and the silicon oxide film 11B cannot be automatically lifted off and removed as described in col. 4, lines 58-61 in Lee. The combination of Sakai et al. and Lee clearly fails to disclose all limitations of claim 9. Furthermore, in the present application, after the wet etching step of the oxide layer, only the silicon nitride

layer above the edge of the shallow trench is exposed, so the control of the thickness of the oxide layer in the shallow trench is better than that of Lee. Therefore, the method of the present application has made an improvement over the prior art.

Just as described above, since the combination of Sakai et al. and Lee does not disclose all limitations of amended claim 9 of the present application, and in the absence of a proper motivation to combine the teachings disclosed by Sakai et al. with the teachings disclosed by Lee, amended claim 9 is allowable.

Since claim 9 is allowable, dependent claims 10-14 each of which depends from independent claim 9 are likewise believed to be allowable. Accordingly, the applicants respectfully request that the section 103(a) rejections be withdrawn.

CONCLUSION

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached appendix is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

In light of the above amendments and remarks, it is respectfully submitted that the present application is in suitable condition for allowance and a Notice to that effect is earnestly solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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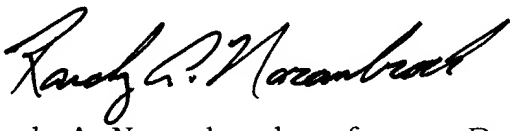

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please cancel claims 4 and 5.

Please amend claims 1, 9 and 17 as follows:

1. ***(Twice amended)*** A method of forming a shallow trench isolation structure, comprising:

forming an oxide layer to cover a substrate, wherein the substrate has a first silicon nitride layer formed thereon, and a shallow trench is located in the substrate and the first silicon nitride layer;

performing a wet etching step to etch the oxide layer until the first silicon nitride layer above the edge of the shallow trench is about exposed;

forming a second silicon nitride layer to cover the oxide layer and the first silicon nitride layer;

forming a photoresist to cover the second silicon nitride layer;

defining the photoresist to expose a portion of the second silicon nitride layer, and performing a dry etching step to [etching]etch [a] the exposed portion of the second silicon nitride layer and the oxide layer beneath the exposed portion of the second silicon nitride layer until the first silicon nitride layer is exposed; and

removing the photoresist, the second silicon nitride layer, and the first silicon nitride layer, and the oxide layer between the second silicon nitride layer and the first silicon nitride layer is removed while the second silicon nitride layer and the first silicon nitride layer are removed.

9. ***(Twice amended)*** A method of forming a shallow trench isolation structure, comprising:

forming an oxide layer to cover a substrate, wherein the substrate has a silicon nitride layer formed thereon, and a shallow trench is located in the substrate and the silicon nitride layer;

performing a wet etching step to etch the oxide layer until the silicon nitride layer above the edge of the shallow trench is about exposed;

forming a photoresist to cover the oxide layer;

defining the photoresist to expose a portion of the oxide layer, and etching the portion of the oxide layer until the silicon nitride layer is exposed; and

removing the photoresist and the silicon nitride layer completely, and the oxide layer is removed while the silicon nitride layer is removed.

17. ***(Twice amended)*** A method of forming a shallow trench isolation structure, comprising:

providing a substrate, and the substrate has a first silicon nitride layer thereon;

defining a shallow trench on the substrate by a dry etch;

forming an oxide layer to cover the first silicon nitride layer and the shallow trench by a chemical vapor deposition;

performing a wet etch step to etch the oxide layer until the first silicon nitride layer above the edge of the shallow trench is about exposed;

forming a second silicon nitride layer to cover the oxide layer and the first silicon nitride layer;

forming a defined photoresist on the second silicon nitride layer so that

a portion of the second silicon nitride layer is exposed;

performing a dry etching step to [etching]etch the exposed portion of the second silicon nitride layer and the oxide layer beneath the exposed portion of the second silicon nitride layer until the first silicon nitride layer is about exposed; and

removing the second silicon nitride layer and the first silicon nitride layer by a wet bench, and the oxide layer between the second silicon nitride layer and the first silicon nitride layer is removed while the second silicon nitride layer and the first silicon nitride layer are removed.